

Can You Eat a Mangrove?: Balancing Conservation and Development in the Management of Mangrove Ecosystems in Cuba

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I. INTRODUCTION

Cuban environmental legislation has evolved significantly since the 1997 passage of Law No. 81, a framework statute that established rights and responsibilities, institutional arrangements, and decision-making authority in a vast array of environmental areas.¹ This statute was soon followed by a new Forestry Law in 1998 and forestry regulations in 1999,² the Protected Areas Decree Law in 1999,³ Environmental Impact Assessment regulations in 1999,⁴ and the Coastal Zone Management Decree Law in 2000.⁵ This body of legislation relates directly to coastal wetland ecosystems, particularly mangrove forests.

This Article begins with a brief description of the mangrove ecosystem and its importance and distribution in Cuba. It continues with a description of the relevant legislation related to mangrove forests and management strategies that Cuban authorities use to regulate activities in this ecosystem. The final parts highlight some of Cuba's accomplishments in this area of natural resource law and policy, as well as the obstacles that the authorities and the mangrove ecosystem face.

II. MANGROVES—WHAT ARE THEY AND WHY ARE THEY IMPORTANT?

Mangroves are salt tolerant (halophytic), vegetative communities composed of twelve genera in eight different families of trees and shrubs.⁶ The species' morphologies are adapted for growth at the interface between the land and coastal ocean waters, where they are regularly exposed to the influence of tides, as well as upstream

1. See Oliver A. Houck, *Environmental Law in Cuba*, 16 J. LAND USE & ENVTL. L. 1, 23 (2000) (describing the circumstances surrounding the creation of Law No. 81).

2. Ley Forestal, LEY NO. 85 [Forestry Law, LAW NO. 85] (1998) (Cuba).

3. Del Sistema Nacional de reas Protegidas, DECRETO-LEY NO. 201 [Decree Law of the National System of Protected Areas, DECREE LAW NO. 201] (1999) (Cuba).

4. Reglamento del Proceso de Evaluación de Impacto Ambiental, RESOLUCIÓN NO. 77/99 [Environmental Impact Assessment Regulations, RESOLUTION NO. 77/99] (1999) (Cuba).

5. Gestión de la Zona Costera, DECRETO-LEY NO. 212 [Coastal Zone Management Decree Law, DECREE LAW NO. 212] (2000) (Cuba).

6. Ariel E. Lugo & Samuel C. Snedaker, *The Ecology of Mangroves*, 5 ANN. REV. OF ECOLOGY & SYSTEMATICS 39, 43 (1974).

freshwater inputs. These forests are common on mudflats, shores of estuaries and bays, protected islands, and small islands in shallow bays in many tropical and subtropical areas of the world.⁷

In the New World, along the Atlantic coast of the Americas, mangroves extend from St. Augustine, Florida, USA (28° 50' N) to Santa Catarina in southern Brazil (28° 30' S).⁸ The New World tropics are relatively poor in mangrove species diversity; only 11 mangrove species grow in the New World tropics compared to about 60 in Asia.⁹

Mangroves make important contributions to coastal ecosystems in the tropics. It is difficult, of course, to place a monetary value on these nonuse functions, but they are generally thought to exceed the value of direct uses, i.e., wood products and charcoal.¹⁰

The ecosystem functions provided by mangroves are many and varied.¹¹ Mangroves support a complex aquatic food web that may also include adjacent sea grass beds and coral reefs. For instance, in Florida, most species of commercial and recreational fish are associated with food webs whose basis is detritus from mangroves.¹² Upon decomposition, leaf litter produces organic matter for nearshore food webs. Exports of organic material of mangrove origin may account for as much as 80% of the total energy budget in some nearshore bays.¹³

The mangrove habitat also serves as nursery grounds for many species of commercially important fish and shellfish. These juveniles seek protection from predators, as well as food for survival. Snappers, snooks, mullet, and mojarra are among the many fish that spend part of their life cycle in mangroves.¹⁴ Mangroves are also rich areas for fish and shellfish (penaeid shrimp, lobster, crabs, oysters, and bivalves) that live in the waters, on the mangrove prop-roots, and in the muddy substrate. Most of the penaeid shrimp fisheries in the New World are associated

7. See generally P.B. TOMLINSON, *THE BOTANY OF MANGROVES* 25 (1986); Luiz Drude de Lacerda et al., *American Mangroves*, in *MANGROVE ECOSYSTEMS: FUNCTION AND MANAGEMENT* 1, 14-16 (Luiz D. de Lacerda ed., 2002).

8. MARK SPALDING ET AL., *WORLD MANGROVE ATLAS* 94 (1997); TOMLINSON, *supra* note 7, at 40.

9. de Lacerda et al., *supra* note 7, at 12.

10. See Lugo & Snedaker, *supra* note 6, at 39-40.

11. TOMLINSON, *supra* note 7, at 166; Lugo & Snedaker *supra* note 6, at 41; Luiz D. de Lacerda & Yara Schaeffer, *Mangroves of Latin America: The Need for Conservation and Sustainable Utilization*, in *ECOSISTEMAS DE MANGLAR EN AMÉRICA TROPICAL* 5, 6 (Alejandro Yáñez-Arancibia & Ana L. Lara-Domínguez eds., 1999).

12. Lugo & Snedaker *supra* note 6, at 55; see also Ariel Lugo, *Mangrove Ecosystem Research with Emphasis on Nutrient Cycling*, in *ECOSISTEMAS DE MANGLAR EN AMÉRICA TROPICAL*, *supra* note 11, at 17, 28.

13. Lugo & Snedaker *supra* note 6, at 49.

14. de Lacerda et al., *supra* note 7, at 24.

with mangroves and mangrove-fringed coastal lagoons during different stages of their life histories.¹⁵

In addition to their importance to commercial fish and shellfish, mangroves provide a habitat for an array of species of fish, migratory birds, and reptiles and are critical for the maintenance of biodiversity. Insular Cuba has the highest species diversity in the West Indies, as well as the highest endemism in the region.¹⁶ Mangroves are also the first defense against storms, wave action, and coastal erosion. They help protect and stabilize shorelines with their root systems. This is particularly important in Cuba, which often lies in the path of tropical storms.

III. MANGROVE ECOSYSTEMS IN CUBA

Cuba is the largest Caribbean island (110,920 km²) with a long coastline (5746 km) composed of many bays and estuaries, coastal lagoons, and barrier islands.¹⁷ These coastal habitats, together with tropical temperatures, are ideal for the growth of mangrove forests.¹⁸ Indeed, mangroves grow on about 70% of the Cuban coastline.¹⁹

Cuba has the third greatest area of mangroves of any country in the Western Hemisphere after Brazil and Venezuela.²⁰ Mangroves cover between 4.8% and 7% of the surface area of Cuba and between 26% and 46% of the inland nation's forested area.²¹ The mangrove area is approximately 531,200 hectare (ha.), with estimates ranging as high as

15. *Id.* at 30; Gordon Thayer & Peter Sheridan, *Fish and Aquatic Invertebrate Use of the Mangrove Prop-Root Habitat in Florida*, in ECOSISTEMAS DE MANGLAR EN AMÉRICA TROPICAL, *supra* note 11, at 167, 170-72.

16. IUCN, PROTECTED AREAS OF THE WORLD: A REVIEW OF NATIONAL SYSTEMS, VOL. 4: NEARCTIC AND NEOTROPICAL 353 (1992). The rate of endemism in vascular plants is 51%.

17. Ciro Milian Padrón et al., *Mangroves of Cuba*, in CONSERVATION AND SUSTAINABLE UTILIZATION OF MANGROVE FORESTS IN LATIN AMERICA AND AFRICAN REGIONS, PART 1—LATIN AMERICA 147 (L.D. Lacerda ed., 1993).

18. *Id.* at 147-54.

19. CENTRO DE INFORMACIÓN, GESTIÓN Y EDUCACIÓN AMBIENTAL, PANORAMA AMBIENTAL DE CUBA 2000, at 17 (2001) [hereinafter CIGEA]; Ciro Milian Padrón, *Manglar en la Cuenca del Río Cauto*, CUBA FORESTAL, 2000, at 3.

20. L.D. de Lacerda et al., *Mangrove Ecosystems of Latin America and the Caribbean: A Summary*, in CONSERVATION AND SUSTAINABLE UTILIZATION OF MANGROVE FORESTS IN LATIN AMERICA AND AFRICAN REGIONS, PART 1—LATIN AMERICA, *supra* note 17, at 1, 5.

21. INSTITUTO CUBANO DE GEODESIA Y CARTOGRAFÍA, ATLAS DE CUBA 40 (1978); SPALDING ET AL., *supra* note 8, at 100; Raúl E. Báez & Ivonne Diago, *El Patrimonio Forestal de Cuba: Su Importancia Económica, Ecológica, y Social*, 1(0) CUBA FORESTAL, 1998, at 17, 21; Leda Menéndez et al., *Mangroves of Cuba: Legislation and Management*, in EL ECOSISTEMA DE MANGLAR EN AMÉRICA LATINA Y LA CUENCA DEL CARIBE: SU MANEJO Y CONSERVACIÓN 76 (Daniel Suman ed., 1994).

784,800 ha.²² From the perspective of foresters, Cuban mangroves provide a significant timber resource. Estimates of the total timber of Cuba's mangrove forests is 19.5 million m³ with average timber volume-per-hectare of 40-150 m³.²³

There is no historical information available on mangrove extension in Cuba. It is possible, however, to analogize to the total forest area decrease and subsequent increase in size to approximate historic mangrove extension patterns. Forest areas decreased in size from 54% of total land in 1900 to 14% by the Revolution in 1959.²⁴ Since 1959, the forested area increased to 18.2% of total land area in 1989 and over 21% in 1998.²⁵ Mangrove extension may parallel this general trend, at least in regard to the reforestation campaigns that began in the early 1980s. But, given their remoteness, major deforestation of mangrove areas prior to the 1959 Revolution was unlikely.

The principal mangrove zones in Cuba are located on the north and south coasts. Zones with important mangrove ecosystems extend from: Archipelago Los Colorados from Bahía Honda to San Antonio (North West Coast), Sabana-Camagüey Archipelago from Punta Hicacos to Bahía de Nuevitas (North Central Coast), interior of Archipelago Jardines de la Reina from Casilda to Cabo Cruz (South Central Coast), and Ciénaga de Zapata from Bahía de Cochinos de Cabo Francés (South West Coast). The Zapata Peninsula, located on the South Central Coast, contains the largest extension of mangroves in Cuba. See map of Cuban Mangroves on the next page.

Mangroves with the highest productivity and development are found on Cuba's south coast. In sites where conditions are optimal, Cuban mangroves may reach 20-25 meters in height, while dwarf mangroves under stressed conditions may reach only 2-3 meters in height.²⁶

Four plant species of mangrove grow in Cuba: *Rhizophora mangle* (red mangrove/mangle rojo), *Avicennia germinans* (black mangrove/mangle prieto), *Laguncularia racemosa* (white mangrove/patabán), and

22. CIGEA, *supra* note 19, at 16; SPALDING ET AL., *supra* note 8, at 100; Ciro Milián Padrón, *Estudio de Caso: Manejo Integrado de Ecosistemas de Manglar en Cuba*, in MANEJO PRODUCTIVO DE MANGLARES EN AMÉRICA CENTRAL 293-302 (Tania Ammour et al. eds., 1999).

23. Milián Padrón et al., *supra* note 17, at 147-54.

24. *Id.* at 151.

25. CIGEA, *supra* note 19, at 15; TERESITA GONZÁLEZ & IGNACIO GARCÍA, CUBA: SU MEDIO AMBIENTE DESPUÉS DE MEDIO MILENIO 29 (1998); Milián Padrón et al., *supra* note 17, at 151.

26. Milián Padrón et al., *supra* note 17, at 149.

Conocarpus erectus (buttonwood/yana).²⁷ Some ecologists, however, consider the latter species (buttonwood) to be a mangrove associate rather than a true mangrove.²⁸

IV. LEGISLATION RELATED TO MANGROVES

Given the abundant mangrove resources in Cuba, and their economic and ecological importance, it is necessary to consider how the state manages them, whether the uses allowed are sustainable, and how the legal authorities treat these resources. This is particularly relevant in light of the comprehensive body of environmental legislation enacted during the last decade.²⁹

The National Commission for the Protection of the Environment and the Conservation of Natural Resources (COMARNA), established in 1976, was the principal environmental authority in Cuba.³⁰ Most of the institutions of the central government were members of COMARNA and were represented on the Council of Ministers.³¹ Although COMARNA was inclusive, it lacked independent authority.³²

In 1994, the creation of the Ministry of Science, Technology and the Environment (CITMA) centralized the Cuban environmental institutions and elevated these concerns to the ministerial level.³³ One of CITMA's first tasks was the development of the National Environmental Strategy in 1997.³⁴ This document, developed by CITMA in coordination with many other government agencies, established a source of national environmental goals and recommendations.³⁵ One of these recommendations designated CITMA as the focal point for environmental policy in Cuba.³⁶ The Strategy also emphasized the necessity of exercising special precaution with development plans in fragile ecosystems, especially

27. Leda Menéndez & Angel Priego, *Los Manglares de Cuba: Ecología, in EL ECOSISTEMA DE MANGLAR EN AMÉRICA LATINA Y LA CUENCA DEL CARIBE: SU MANEJO Y CONSERVACIÓN*, *supra* note 21, at 64-75.

28. TOMLINSON, *supra* note 7, at 232.

29. See Fredric Evenson, *A Deeper Shade of Green: The Evolution of Cuban Environmental Law and Policy*, 28 GOLDEN GATE U. L. REV. 489, 489-525 (1998); Houck, *supra* note 1, at 13-25 (providing an overview of Cuban environmental law and policy up to and including the passage of Law No. 81).

30. GONZÁLEZ & GARCÍA, *supra* note 25, at 51.

31. See Houck, *supra* note 1, at 15.

32. See *id.* at 15-16; see also Oliver A. Houck, *Cuba's New Law of the Environment: An Introduction*, in CUBAN ENVIRONMENTAL LAW 1, 1-9 (Jerry Speir ed., 1999).

33. Houck, *supra* note 1, at 19-21.

34. *Id.* at 21.

35. *Id.*; Houck, *supra* note 32, at 4-5.

36. GONZÁLEZ & GARCÍA, *supra* note 25, at 68.

tourism infrastructure developments on keys and coastal zone tourism in general.³⁷

A. *Environmental Law [Law No. 81]*³⁸

Law No. 81 is the comprehensive framework law that guides the management of natural resources and the environment in Cuba.³⁹ All other environmental legislation and regulations refer back to this framework law and to the definitions and principles that it sets forth. Law No. 81 sets forth Cuban policy with regard to the rational exploitation of natural resources.⁴⁰ The law also states that environmental management should be integrated and multisectoral, and should coordinate the actions of state institutions, society, and citizens.⁴¹

Law No. 81 grants CITMA the responsibility of proposing environmental policies and guiding their implementation in coordination with other institutions.⁴² CITMA oversees the sectoral environmental strategies of state institutions⁴³ and conciliates conflicts and discrepancies between these institutions over environmental protection and rational use of natural resources.⁴⁴ The law also sets forth requirements for other state institutions outside of CITMA. All state agencies must integrate environmental protection into their plans, policies, and development recommendations, as well as develop and implement sectoral environmental strategies.⁴⁵

CITMA's authority to direct and control Cuba's National System of Protected Areas (SINAP) also stems from Law No. 81.⁴⁶ This authority includes the responsibility to establish guidelines for the selection, establishment, and management of protected areas.⁴⁷ The legislation notes the multiple objectives of the SINAP, including several that are particularly relevant to mangroves: managing forestry resources, im-

37. EULALIA VIAMONTES GUILBEAUX ET AL., *DERECHO AMBIENTAL CUBANO* 230 (2000).

38. Ley del Medio Ambiente, LEY NO. 81 [Environmental Law, LAW NO. 81] (1997) (Cuba), *translated in* CUBAN ENVIRONMENTAL LAW, *supra* note 32, at 21.

39. *See generally* Houck, *supra* note 1, at 9-10 (providing an explanation of the origin and authority of Laws (Leyes), Decree Laws (Decreto Leyes), Decrees (Decretos), and Regulations (Resoluciones)).

40. LEY NO. 81, art. 4(c).

41. *Id.* art. 4(j).

42. *Id.* arts. 11-12.

43. *Id.* art. 12(b).

44. *Id.* art. 12(f).

45. *Id.* art. 13(a), (c).

46. *Id.* arts. 12(j), 89.

47. *Id.*

proving the socioeconomic status of local communities through conservation, and the rational use of fragile ecosystems.⁴⁸

Regulation of mangrove ecosystems is the shared authority of CITMA and the Ministry of Agriculture (MINAGRI)/State Forestry Service. This is stated in the “Maritime Waters and Marine Resources” section and the “Forest Patrimony” section of Law No. 81.⁴⁹

Law No. 81’s section on “Forest Patrimony” notes that MINAGRI has classified forests into three categories: productive, protective, and conservation.⁵⁰ Productive forests satisfy the national demand for wood and forestry products, and should be managed rationally. Protective forests should be permanently preserved, though productive activities may occur in these forests on a secondary basis. No extractive activities may occur in forests in the conservation category. As a national policy, Law No. 81 states that there shall be no reduction in Cuba’s forested areas.⁵¹ However, it is unclear whether this means the total area of forest patrimony, each category of forest, or each species-specific type of forest.

*B. Environmental Impact Assessment (EIA) [Resolution No. 77/99]*⁵²

Law No. 81, as well as CITMA’s regulations (Resolution No. 77/99) adopted in 1999, set forth the framework for the EIA process in Cuba.⁵³ Every activity that may produce a significant environmental impact requires a license issued by CITMA.⁵⁴ CITMA and the competent authorities make the threshold determination of whether an environmental impact study (EIS) is necessary.⁵⁵ The EIS includes a project description, analysis of project alternatives and impacts, discussion of the relationship between economic costs and environmental impacts of each alternative, and consideration of mitigation measures.⁵⁶ CITMA may grant or deny the license application without an EIS, or may condition the approval of the license on preparation and CITMA’s subsequent evaluation of the EIS.⁵⁷

48. *Id.* art. 90.

49. *Id.* arts. 105, 115.

50. *Id.* art. 113.

51. *Id.* art. 114.

52. Reglamento del Proceso de Evaluación de Impacto Ambiental, RESOLUCIÓN NO. 77/99 [Environmental Impact Assessment Regulations, RESOLUTION NO. 77/99] (1999) (Cuba).

53. *See* GONZÁLEZ & GARCÍA, *supra* note 25, at 78 (providing a history of previous regulations concerning the EIA process prior to approval of Law No. 81).

54. LEY NO. 81, art. 24.

55. RESOLUCIÓN NO. 77/99, art. 23.

56. *Id.* art. 25.

57. *Id.* arts. 18, 30.

Both the Environmental Law and its regulations list a number of categories of new or continuing activities that may require an EIS.⁵⁸ Included among these are several categories that commonly affect mangroves, such as drainage canals and dredging projects, tourist facilities (especially those in coastal ecosystems), port projects, forestry and aquaculture projects, land-use changes, and activities in protected areas that were not considered in the areas' management plan. CITMA and the appropriate institutions have the responsibility to determine the extent of the environmental impacts for each of these EIS-triggering activities.⁵⁹ CITMA/CICA (Center for Environmental Inspection and Control) have developed detailed guidelines for the preparation of applications for environmental licenses and the EIS.⁶⁰ These guidelines set forth requirements for different types of developments, including forestry projects, tourism in protected areas, and port developments.

Following evaluation of the EIA by an interagency group selected by CITMA, CITMA may grant or reject the environmental license application.⁶¹ If the project activities do not comply with the terms and conditions of the environmental license, CITMA may temporarily, or permanently, enjoin the project.⁶² In 2000, CITMA approved 736 environmental licenses of the 748 requested.⁶³

CITMA, in coordination with other institutions, may also require a "strategic" EIA for management plans of various agencies.⁶⁴ Included among these plans are urban development plans, forestry management plans, tourism development plans, and fishery management plans.⁶⁵ Although these planning documents may require an EIA, they do not require an environmental license.⁶⁶

C. *Forestry Law [Law No. 85]*

The 1998 Forestry Law and its 1999 regulations (Resolution No. 330/99 and Decree Law No. 268) create a modern and clear expression of responsibility and competency for managing Cuba's forest patrimony.⁶⁷

58. LEY No. 81, art. 28; RESOLUCIÓN No. 77/99, art. 6.

59. LEY No. 81, art. 28.

60. CITMA/CICA, GUÍAS PARA LA REALIZACIÓN DE LAS SOLICITUDES DE LICENCIA AMBIENTAL Y LOS ESTUDIOS DE IMPACTO AMBIENTAL (2001).

61. LEY No. 81, art. 33.

62. *Id.* art. 26.

63. CITMA, CUBA: ENVIRONMENT AND SUSTAINABLE DEVELOPMENT 10 YEARS AFTER RIO DE JANEIRO SUMMIT – "RIO + 10" 12 (2002).

64. (LEY No. 81, art. 31); GUILBEAUX ET AL., *supra* note 37, at 128-29.

65. LEY No. 81, art. 31.

66. *Id.*

67. Ley Forestal, LEY No. 85 [Forestry Law, LAW No. 85] (1998) (Cuba).

Both the law and regulations stress interagency coordination and complement existing environmental legislation, particularly Law No. 81.

The Forestry Law grants MINAGRI the prime responsibility of planning for the sustainable use and management of forestry resources in Cuba.⁶⁸ The law explicitly states that MINAGRI should coordinate its activities with other responsible authorities, namely CITMA and the Ministry of the Interior, which has been responsible for enforcement via the Forest Rangers since 1995.⁶⁹ Regulation and management of mangroves and other coastal vegetation is the shared responsibility of MINAGRI and CITMA.⁷⁰ While MINAGRI is responsible for the productive aspects of forestry management and for the development of forestry management plans, Law No. 85 grants CITMA the authority to evaluate and oversee environmental protection, conservation, and sustainable development programs for forestry resources.⁷¹

The law grants authority to both MINAGRI and CITMA for managing forestry resources in Protected Areas. MINAGRI proposes and implements forestry management plans in Protected Areas under its administration, while CITMA ensures that the activities in Protected Areas conform to the category and management plan for the area.⁷²

Within MINAGRI, the State Forestry Service implements sustainable forestry programs; evaluates, proposes, and approves forestry management programs; grants timber harvest permits; and, jointly with CITMA, approves forest classifications.⁷³ The regulations of the Forestry Law detail the division of State Forestry Service responsibilities between the municipal, provincial, and national levels.⁷⁴

As noted above, MINAGRI, through the Forestry Law, has established the following categories of forests: productive forests, protective forests, and conservation forests.⁷⁵ The State Forestry Service can allow timber cutting in productive forests according to approved forestry management plans.⁷⁶ Protective forests include two different types: protective of waters and soils (i.e., watersheds) and shoreline protective forests.⁷⁷ The functions of the latter include protection against

68. *Id.* arts. 6-7.

69. *Id.* art. 9; Manuel A. Lama, *Cuerpo de Guardabosques, CUBA FORESTAL*, 2000, at 6-7.

70. LEY NO. 85, art. 7(e).

71. *Id.*

72. *Id.* arts. 7(g), 8.

73. *Id.* arts. 10-11.

74. Reglamento de la Ley Forestal, RESOLUCIÓN NO. 330/99 [Forestry Law Regulations, RESOLUTION NO. 330/99], arts. 1-11 (1999) (Cuba).

75. LEY NO. 85, art. 15; Báez & Diago, *supra* note 21, at 17, 19.

76. LEY NO. 85, art. 17.

77. *Id.* art. 18.

storms and wind, saltwater intrusion, and flooding, as well as conservation of coastal ecosystems and coastal flora and fauna.⁷⁸ The law allows limited individual and group exploitation of trees in corridors perpendicular to the direction of the average winds, but prohibits the permanent elimination of vegetation.⁷⁹ The third category of forest (conservation) is divided into subtypes: special management, protection and conservation of fauna, recreational, and educational and scientific.⁸⁰ Special Management Forests generally correspond to Natural Reserves or National Parks. The law prohibits any timber exploitation in these forests in strict compliance with the management plan developed by the State Forestry Service.⁸¹

The Forestry Law also specifies that, regardless of the forest category, no timber exploitation can occur in shoreline mangroves or on keys.⁸² The width of the shoreline mangroves is established by regulation.⁸³ Article 39 of the Forestry Law regulations states the “width of the shoreline forests will not be less than thirty meters from the maximum point of tidal influence.”⁸⁴ This definition, however, is imprecise and unclear because “the maximum point of tidal influence” is a meaningless concept. It may simply mean a 30-meter width of mangrove forest. It might also mean 30 meters from the Mean High Water or the Highest High Water. The regulations also leave open the possibility of site-specific determinations of the width of the shoreline forest.⁸⁵ In addition, the regulations prohibit construction of homes and installations, cultivation, and earth movement in the shoreline forest.⁸⁶

MINAGRI, after consulting with other competent authorities, is ultimately responsible for approving Forestry Management Projects.⁸⁷ The State Forestry Service National Directorate and State Forestry Enterprises (FORCUBA) then jointly develop Ten-Year Management Plans approved by ministerial resolution.⁸⁸ The regulations obligate the

78. *Id.* art. 20.

79. *Id.* art. 21.

80. *Id.* art. 22.

81. *Id.* art. 23.

82. *Id.* art. 27.

83. *Id.* art. 27.

84. Reglamento de la Ley Forestal, RESOLUCIÓN NO. 330/99 [Forestry Law Regulations, RESOLUTION NO. 330/99], art. 39 (1999) (Cuba).

85. *Id.* art. 39.

86. *Id.* art. 40.

87. LEY NO. 85, art. 31.

88. RESOLUCIÓN NO. 330/99, arts. 45-49.

State Forestry Enterprises to comply with the approved Forestry Management Plan.⁸⁹

A critical component of Cuban forestry management concerns reforestation, another responsibility of MINAGRI.⁹⁰ The Forestry Law requires reforestation in productive forests where timber exploitation has been allowed and in shoreline forests.⁹¹ Natural forest regeneration is preferable, but if that is not possible, the State Forestry Service will take an active role in reforestation.⁹²

All three ministries mentioned above (MINAGRI, CITMA, and Interior) are jointly responsible for the conservation of forest patrimony.⁹³ The State Forestry Service can authorize nonforestry activities that will not change the use of the forest and do not require an environmental license, as long as the project plan causes the least possible damage to the ecosystem.⁹⁴ According to the regulations, the approval of such a project occurs at the municipal or provincial level of the State Forestry Service.⁹⁵ Other projects and activities that could possibly damage the forest patrimony require an evaluation before MINAGRI grants a permit.⁹⁶ The regulations, however, state that this approval is from the provincial office of the State Forestry Service.⁹⁷ Projects that will permanently convert the forest into other uses require the approval of the National Forestry Directorate after consultation with CITMA.⁹⁸ The regulations also require the developer to compensate the state for these changes.⁹⁹

Chapter II of Decree Law No. 268 establishes sanctions for damages to forestry patrimony and resources.¹⁰⁰ Fees are established per tree cut, without proper permission, and vary according to the ecological importance of the resource and the type of illegal activity.¹⁰¹ Converted into hard currency, the fines are extremely low. For example, cutting a tree without permission in a productive forest results in a 100 peso

89. *Id.* art. 99.

90. LEY No. 85, arts. 34-35.

91. *Id.* art. 35.

92. *Id.* art. 36.

93. *Id.* art. 51.

94. *Id.* art. 56.

95. RESOLUCIÓN No. 330/99, art. 125.

96. LEY No. 85, art. 57.

97. RESOLUCIÓN No. 330/99, art. 128.

98. *Id.* art. 149.

99. *Id.* art. 150.

100. Contravenciones de las Regulaciones Forestales, DECRETO-LEY No. 268 [Violations of the Forestry Regulations, DECREE LAW No. 268] (1999) (Cuba).

101. *Id.*

(US\$4) fine per tree.¹⁰² The fine for cutting a tree in a conservation forest amounts to 1000 pesos (US\$40).¹⁰³

*D. Coastal Zone Management: Decree Law No. 212*¹⁰⁴

The genesis of the coastal zone decree law can be traced to 1991, when an interdisciplinary group of professionals from various institutions began preparation of the draft decree law forming the basis of the decree law eventually adopted in 2000.¹⁰⁵ One reason for the long gestation period for this decree law was the internal debate over the degree of protection the instrument should provide mangrove ecosystems.¹⁰⁶ From the earliest moments, discussions centered around two distinct zones: the coastal zone and a protective buffer zone. With respect to mangrove coastlines, the group reached consensus that the landward limit of the coastal zone should extend to the highest tidal reach or, therefore, to the limit of the mangrove ecosystem.¹⁰⁷

The State Council finally adopted Decree Law No. 212 in 2000.¹⁰⁸ This legislation defines the coastal zone in variable width depending on the different geomorphological formations of the coastline.¹⁰⁹ For example, low terraces, coastal cliffs, beaches, mangrove coastlines, river mouths, and other coastal areas all receive their own special treatment for legal purposes.¹¹⁰ When mangrove coastlines are present, the coastal zone extends to their maximum landward extent regardless of the distance from the open ocean.¹¹¹ The purpose of the protective zone, located landward of the coastal zone, is to mitigate the negative effects of human impacts on the coastal zone. In order to accomplish this goal, the

102. *Id.* art. 4(c).

103. *Id.* art. 6(a).

104. Gestión de la Zona Costera, DECRETO-LEY NO. 212 [Coastal Zone Management Decree Law, DECREE LAW NO. 212] (2000) (Cuba).

105. Menéndez et al., *supra* note 21, at 76-84.

106. One extremely contentious issue centered on the possibility of disposal of construction wastes from tourism facilities in mangroves. Interview with Leda Menéndez, Institute of Ecology and Systematics, CITMA, in Havana, Cuba (Aug. 14, 2002). Another debate centered on whether all or only a portion of mangroves would be included in the definition of the coastal zone. Interview with Carlos Álvarez, CICA, CITMA, in Havana, Cuba (Aug. 15, 2002).

107. Menéndez et al., *supra* note 21, at 80. Buttonwood (*Conocarpus erectus*) may grow above the reach of the tides. Some in the ecological community consider this species to be a mangrove, while others consider it a mangrove associate.

108. Houck, *supra* note 1, at 43.

109. DECRETO-LEY NO. 212, art. 4.

110. *Id.*

111. *Id.* art. 4(d).

minimum width of the protective zone for mangrove coastlines is 40 meters measured from the inland boundary of the coastal zone.¹¹²

In coastal zone management, CITMA again plays a coordinating role. The Ministry proposes policies and strategies for integrated coastal management in coordination with the other competent agencies and institutions in the zone.¹¹³ The Ministry of Economics and Planning and its Institution of Physical Planning (IPF), responsible for land-use planning, must also consider the coastal zone in the development of land-use plans.¹¹⁴ CITMA participates in the discussion, evaluation, and approval of zoning plans.¹¹⁵

The decree law specifies that access to the coastal zone should be unrestricted, without charge, and open to public activities that do not require facilities and construction.¹¹⁶ The decree law establishes a presumption against construction of new facilities and residential and lodging areas in the coastal zone.¹¹⁷ However, authorization may be granted for the development of activities that are coastal dependent and that, by their nature, cannot be sited elsewhere. These activities include ports, marinas, mariculture activities, ocean outfalls, oil platforms, maritime aides, and reforestation projects.¹¹⁸ One could imagine that many of these types of installations have the capability to directly impact mangroves. Therefore, Coastal Dependent Use may conflict with Shoreline Protective Forests.

Construction projects or activities in the coastal zone or protective zone must obtain an environmental license, as specified by the Environmental Law.¹¹⁹ Remember, however, that state institutions' management plans are exempt from the environmental license requirement. The decree law expressly states that activities planned for keys require an EIS as a requisite for the environmental license.¹²⁰ If the key is completely covered with mangroves, or is so small that it is entirely within the coastal zone or protective zone, no construction will be authorized.¹²¹ CITMA has the responsibility of identifying the particularly fragile keys that meet these characteristics.

112. *Id.* art. 5.2.

113. *Id.* art. 7.

114. *Id.* art. 9.

115. *Id.* art. 8(b).

116. *Id.* art. 12.

117. *Id.* art. 16.

118. *Id.* art. 15.1.

119. Ley Del Medio Ambiente, LEY NO. 81 [Environmental Law, LAW NO. 81], art. 28 (1997) (Cuba) *translated in* CUBAN ENVIRONMENTAL LAW, *supra* note 32, at 21.

120. DECRETO-LEY NO. 212, art. 25.

121. *Id.* art. 26(1).

*E. Protected Areas: Decree Law No. 201*¹²²

Prior to 1998, a National Network of Protected Areas (*Red Nacional de Áreas Protegidas*) existed in Cuba. The network was comprised of national parks, nature reserves, national monuments, wildlife refuges, and “other categories.”¹²³ Many different government institutions and ministries were responsible for the management of different units of protected areas in the Network, with the ultimate responsibility of the Network exercised by COMARNA.¹²⁴

Decree Law No. 201 legally establishes SINAP. CITMA again plays a coordinating role and must ensure the actions and activities of all institutions or entities that operate in the area are compatible with the goals of the protected area.¹²⁵ CITMA approves both the protected area management plan and the annual operational plan.¹²⁶ If CITMA fails to resolve institutional conflicts in protected areas, it can raise the issue before the Council of Ministers.

On-the-ground administration of a protected area may be the responsibility of CITMA (CENAP/National Center of Protected Areas) or other institutions or entities, such as a university research laboratory, the State Forestry Service, the State Flora and Fauna Service (MINAGRI), or the Institute of Oceanology. There is a presumption, however, that CITMA will administer the categories of protected areas with the highest level of protection (natural reserves, national parks, ecological reserves).¹²⁷ The Council of Ministers is charged with approving the declaration of protected areas upon CITMA’s recommendation.

The decree law creates eight categories of protected areas and subsequently describes the objectives and operational philosophy of each. The eight categories of protected areas, from most to least restrictive, are: (1) natural reserve, (2) national park, (3) ecological reserve, (4) outstanding natural feature, (5) managed floristic reserve, (6) wildlife refuge, (7) protected natural landscape, and (8) multiple use area.¹²⁸

122. Del Sistema Nacional de Áreas Protegidas, DECRETO-LEY NO. 201 [Decree Law of the National System of Protected Areas, DECREE LAW NO. 201] (1999) (Cuba).

123. IUCN, *supra* note 16, at 351.

124. *Id.* at 352.

125. DECRETO-LEY NO. 201, arts. 8, 55.

126. Pedro Ruiz, CENAP, CITMA, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 13, 2002).

127. DECRETO-LEY NO. 201, art. 58.

128. *Id.* art. 5.

The regulations create the possibility of buffer zones surrounding protected areas.¹²⁹ These zones promote the protection, control, and mitigation of external impacts on the protected area.¹³⁰

The administration and management authorities of each protected area are responsible for elaboration of the management plan that CITMA subsequently must approve within two years of the creation of the protected area.¹³¹ CITMA must develop the general guidelines for the development of management plans for each of the management categories.¹³² The management plan must be compatible with the land-use plan based on the category of the area.¹³³ CITMA and the institution in charge of administration of the area are both responsible for compliance.¹³⁴

Activities carried out in a protected area or buffer zone require an environmental license issued prior to approval of the activity, and must be coordinated with the managers of the protected area.¹³⁵ CITMA must also participate in the development of regulations related to tourism, mining, and agricultural activities inside protected areas. These activities must be consistent with the management category of the protected area.¹³⁶

V. MANAGEMENT OF MANGROVES

A. *Institute of Physical Planning (IPF)*

The Ministry of Economy and Planning, through its IPF, is responsible for land-use planning in Cuba. In order to promote the rational use of natural resources, encourage the optimal use of space, and to avoid environmental damages, the IPF has developed zoning plans for all provinces.¹³⁷ When the IPF prepares zoning plans in mangrove areas, the Institute consults with CITMA (Institute of Ecology and Systematics) and MINAGRI (State Forestry Enterprises) to determine appropriate

129. *Id.* arts. 51, 52.

130. *Id.* art. 51.

131. *Id.* art. 47.

132. *Id.* art. 56(g). CITMA/CENAP, METODOLOGÍA PARA LA CONFECCIÓN DE LOS PLANES DE MANEJO Y PLANES OPERATIVOS EN ÁREAS PROTEGIDAS (2002). CITMA/CENAP has developed guidelines for the development of management plans in protected areas. As of August 2002, the guidelines had not been formally approved. CENAP, however, had already begun to unofficially apply the methodologies that it recommends.

133. DECRETO-LEY NO. 201, art. 49.

134. *Id.* art. 50.

135. *Id.* arts. 53-54.

136. *Id.* Disp. Esp. 1.

137. GUILBEAUX ET AL., *supra* note 37, at 116.

management techniques.¹³⁸ These recommendations, along with IPF's own criteria, are incorporated into the zoning plans.¹³⁹ The IPF also drafts master plans for tourism zones, during which it is required to consult with CITMA and, when mangroves or forest patrimony are present, MINAGRI (State Forestry Enterprises).¹⁴⁰

New projects must receive IPF approval for consistency with zoning plans (microlocalization).¹⁴¹ The EIA regulations require that, before an applicant applies for an environmental license, he must obtain microlocalization approval.¹⁴²

B. Ministry of Agriculture (MINAGRI)

The Vice Ministry for Forestry of MINAGRI has had the responsibility for managing mangroves in Cuba since 1980.¹⁴³ Some 31 State Forestry Enterprises are responsible for the on-the-ground management and sustainable use of the forest patrimony.¹⁴⁴ These enterprises form a group known as the "Cuban Agro-Industrial Forestry Group."¹⁴⁵ This group formulates management plans based on the forestry potential of the forest and the demand for wood products.

1. Forest Classification and Management Plans

The National Forest Management Plan classifies mangrove forests according to their main role. Over a decade ago, the classification of mangrove forests included: shoreline protection (56%), barriers to seawater intrusion in coastal soils and groundwater (21%), floral and faunal units (16%), timber production zones (6%), national parks (0.5%), natural reserves (0.3%), and recreational units (0.2%).¹⁴⁶ While MINAGRI classifies only 6% of mangrove forests as "productive," it

138. Carlos Rodríguez, IPF, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 12, 2002).

139. *Id.*

140. Norman Medina, Cuban Ministry of Tourism, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 12, 2002); Rodríguez, *supra* note 138.

141. Houck, *supra* note 1, at 29.

142. Reglamento del Proceso de Evaluación de Impacto Ambiental, RESOLUCIÓN NO. 77/99 [Environmental Impact Assessment Regulations, RESOLUTION NO. 77/99], art. 15 (1999) (Cuba).

143. Milian Padrón, *supra* note 22, at 294.

144. Fidel Ramos, *El Sector Forestal Cubano*, CUBA FORESTAL, 1998, at 5-6.

145. *Id.* at 6.

146. Menéndez et al., *supra* note 21, at 81; Milian Padrón, *supra* note 22, at 296; Milian Padrón et al., *supra* note 17, at 149.

places a much higher percentage of all natural forests (34%) in the “productive” category.¹⁴⁷

Each forest category implies a different type of management. In shoreline protection forests, limited wood harvesting is permitted at a distance of greater than 50 meters from the shoreline.¹⁴⁸ All economic activities are prohibited in national parks and natural reserves.¹⁴⁹ The few productive mangrove forests that exist in Cuba are located far from the coastline, and guidelines allow harvest only in corridors that are less than 30 meters wide.¹⁵⁰

The State Forestry Enterprises prepare forest/mangrove management plans that CITMA observes and approves. Currently, CITMA does not require an EIA for the development of the management plan.¹⁵¹

2. Production

Cuban foresters utilize a number of techniques to harvest mangroves.¹⁵² Mature forests (over 25 years old) of black mangroves, white mangroves, and buttonwood may be clear-cut for production of fuel wood, charcoal, and wood for construction purposes.¹⁵³ This involves cutting alternating corridors of 25 to 30 meters in width, leaving between 20 and 40 seed trees per hectare to promote adequate regeneration.¹⁵⁴ These management plans adopt a 30-year rotation period.¹⁵⁵

Selective cutting is sometimes used in the harvest of red mangroves that meet the desired specifications. This technique, however, can be dangerous because it may lead to a degeneration of the quality of the forest and an invasion of undesirable species.

Production of mangrove forestry goods in 1991 included 23,800 m³ of fuelwood, 23,900 sacks of charcoal, 121 tons of bark, and 300 m³ of “cujes” sticks for tobacco drying.¹⁵⁶ Undoubtedly, the major consumer of mangrove products is the sugar industry, which relies on mangrove

147. CIGEA, *supra* note 19, at 15.

148. Milian Padrón, *supra* note 22, at 296.

149. *Id.*

150. *Id.*

151. Teresita Cruz, Dirección del Medio Ambiente, CITMA, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 13, 2002).

152. Milian Padrón, *supra* note 22, at 297-98.

153. *Id.* at 297.

154. *Id.*

155. *Id.*

156. Menéndez et al., *supra* note 21, at 82.

timber as a source of fuel.¹⁵⁷ Mangrove timber production levels have varied widely in recent years. In 1987, mangrove timber accounted for 6%-8% of Cuba's total forest production, but this contribution decreased to 1.5% in 1991.¹⁵⁸ The economic difficulties of the Special Period and limitations on fuel imports are factors that have, most likely, caused an increase in the use of mangroves for fuel in recent years.¹⁵⁹

The State Forestry Enterprises also use mangrove areas for other productive activities. For example, during the four month period that black mangroves are in bloom, over 40,000 beehives are moved into mangroves, especially on the south coast.¹⁶⁰ This activity produces 1700 to 2700 tons of honey annually,¹⁶¹ which is 20%-25% of the national production.¹⁶²

3. Reforestation

Reforestation is a key aspect of mangrove management plans. A mangrove reforestation program began in 1980. By 1987, over 7100 ha. of mangroves had been planted in the program.¹⁶³ Reforestation projects have accelerated in recent years. Almost 44,000 ha. representing all mangrove species were planted between 1984 and 1994.¹⁶⁴ Foresters use natural regeneration in black mangrove, white mangrove, and buttonwood forests. The technique adopted for reforestation of red mangrove forests is direct planting of propagules at distances of 1.0 meter x 1.0 meter to 2.0 meters x 1.60 meters.¹⁶⁵ To encourage the reforestation of mangroves, the State Forestry Service provides economic incentives to its Forestry Enterprises that vary with the survival percentage of mangroves three years after planting.¹⁶⁶

One of the largest reforestation projects is in southern Havana Province, where the Ariguanabo Forestry Company administers 10,000

157. SPALDING ET AL., *supra* note 8, at 100.

158. Milian Padrón et al., *supra* note 17, at 151.

159. Evenson, *supra* note 29, at 492. In 1990, 93% of commercial energy sources were imported, largely in the form of subsidized oil from the Soviet Union. *Id.* As a result of the Special Period, direct foreign investment and energy self-sufficiency are national priority areas. Medina, *supra* note 140.

160. SPALDING ET AL., *supra* note 8, at 100.

161. Milian Padrón et al., *supra* note 17, at 151.

162. CIGEA, *supra* note 19, at 17; see Juan C. Pérez et al., *Análisis del Potencial Melífero del Mangle Prieto*, CUBA FORESTAL, 2000, at 22.

163. Menéndez et al., *supra* note 21, at 84.

164. Milian Padrón, *supra* note 22, at 299.

165. *Id.* at 298-99.

166. Interview with Ciro Milian Padrón, MINAGRI, in Havana, Cuba (Aug. 12, 2002).

ha. of mangroves.¹⁶⁷ Human activities, hurricanes, and pollution from sugar cane agriculture were responsible for the degradation of large extensions of these coastal lands. The reforestation used all four mangrove species depending on site conditions and characteristics of the mangrove species.¹⁶⁸ Reportedly, the restoration project reduced coastal erosion and lowered salinity in adjacent agricultural soils.¹⁶⁹

4. Institutional Coordination

MINAGRI, in coordination with CITMA, possesses clear authority over state forest patrimony. If forests exist in the planning area, the IPF must consult with MINAGRI during the approval process for zoning plans, macrolocalization, and microlocalization.¹⁷⁰ Similarly, CITMA must consult with MINAGRI regarding the approval of environmental licenses and EIS documents when mangroves are located in the area of interest.¹⁷¹ MINAGRI examines the consistency of the proposed activity with its management plan and the potential adverse impacts on the forest patrimony.¹⁷²

An activity that could impact mangroves may require input from several institutions. For example, a shrimp aquaculture facility adjacent to mangroves may need a water-intake canal constructed through those mangroves. The Ministry of the Fishing Industry (MINIP) approves the aquaculture project itself. MINAGRI (State Forestry Enterprise) decides where and when to construct the intake canal, and whether mitigation measures, such as reforestation, are necessary. MINIP requests an environmental license from CITMA and consults with the Forestry Enterprise before reaching a final decision on the project.

If the mangroves are inside a protected area that forms part of the SINAP, the situation may become a bit more complicated, requiring coordination between MINAGRI, CITMA, and the Management Authority of the Protected Area. At least eight national protected areas (and perhaps as many as fourteen) contain mangrove ecosystems.¹⁷³ The

167. Ciro Milian Padrón, *Restauración de Ecosistemas de Manglar en Cuba: Estudio de Caso de Provincia Habana*, in LA RESTAURACIÓN DE ECOSISTEMAS DE MANGLAR 176, 186 (Colin Field ed., 1997).

168. *Id.*

169. *Id.*

170. Rodríguez, *supra* note 138.

171. *Id.*

172. *Id.*

173. CENTRO NACIONAL DE ÁREAS PROTEGIDAS CENAP/CITMA, MARCO LEGAL: SISTEMA NACIONAL DE ÁREAS PROTEGIDAS—CUBA 46, 47 (2000) [hereinafter CENAP]; INSTITUTO CUBANO DE GEODESIA Y CARTOGRAFÍA, *supra* note 21, at 38-41; IUCN, *supra* note 16, at 356-57; SPALDING ET AL., *supra* note 8, at 100.

mangrove area itself forms part of a MINAGRI forest management plan, which is developed by a State Forestry Enterprise.¹⁷⁴ The administering agency of the protected area must incorporate these management guidelines into the area's management plan.¹⁷⁵ CITMA and CENAP then approve the resulting protected area management plan.¹⁷⁶ This process is often simplified if MINAGRI is also the administrator of the protected area, as is often the case for wildlife refuges and managed floristic reserves.

The MINAGRI lists four categories of mangrove areas in Natural Reserves and National Parks that are appropriate for ecotourism and recreation: nature observation areas, health tourism areas, sport hunting areas, and sport fishing areas.¹⁷⁷

C. Ministry of Science, Technology and the Environment (CITMA)

As the central environmental agency in Cuba, CITMA coordinates environmental decision making among public and private actors. A number of research institutes are affiliated with CITMA, including the Institute for Ecology and Systematics, the Institute of Oceanology, and the Institute of Geography. The Institute of Ecology and Systematics has a long tradition of ecological research related to mangrove ecosystems, and often participates in policy discussions and decisions regarding activities that may potentially have adverse impacts on mangroves.¹⁷⁸

CITMA's analysis, surrounding the environmental license and the EIS, plays a crucial role with regard to actions that may impact mangroves. CICA assigns a lead specialist to the analysis. This specialist assembles a group of experts to analyze the environmental license application or the EIS and to evaluate mitigation measures for the proposed monitoring program. Each expert substantiates their evaluation with a written report. The group of experts may represent CITMA-affiliated centers and institutes, such as CENAP (protected areas), the Institute of Ecology and Systematics, the Institute of Oceanology, or the

174. Interview with Ciro Milian Padrón, MINAGRI, in Havana, Cuba (Aug. 13, 2002); interview with Pedro Ruiz, Centro Nacional de Áreas Protegidas CITMA, in Havana Cuba (Aug. 15, 2002).

175. Ley Forestal, LEY NO. 85 [Forestry Law, LAW No. 85], art. 83 (1998) (Cuba).

176. Del Sistema Nacional de Áreas Protegidas, DECRETO-LEY NO. 201 [Decree Law of the National System of Protected Areas, DECREE LAW NO. 2001], art. 47 (1999) (Cuba); Milian Padrón, *supra* note 174; Ruiz, *supra* note 174.

177. Milian Padrón, *supra* note 22, at 301.

178. *See generally* DIRECCIÓN PROVINCIAL DE PLANIFICACIÓN FÍSICA Havana, GESTIÓN DE LA ZONA COSTERA DEL SUR DE LA HABANA (2002).

Institute of Geography.¹⁷⁹ Representatives from other state agencies or university researchers may also participate in the evaluative committee.¹⁸⁰

CITMA also coordinates the SINAP as a whole and may, in certain cases, directly manage protected areas.¹⁸¹ A significant number of protected areas are coastal, including mangrove ecosystems.

In 2000, over 236 protected areas comprised the SINAP, with 79 of these areas being of national significance.¹⁸² These included 14 National Parks, 8 Natural Reserves, 11 Wildlife Refuges, 11 Managed Floristic Reserves, and 8 Multiple Use Areas.¹⁸³ The SINAP comprises over 22% of national territory, 6% of which belongs to the three strictest categories (National Park, Natural Reserve, and Ecological Reserve).¹⁸⁴

The exact percentage of mangrove ecosystems that form part of the SINAP is unknown. However, at least 14 protected areas include mangrove vegetation (5 on the south coast and 9 on the north coast).¹⁸⁵ Two protected areas on the south coast contain the largest extension of mangroves: Ciénaga de Zapata National Park and the Cauto Delta Ecological Reserve.¹⁸⁶

D. Ministry of the Fishing Industry (MINIP)

MINIP is not directly involved in mangrove management. However, nearshore fishing efforts may target species, such as mangrove oysters, that occur in or near mangroves. Because of the importance of mangroves for fishery resources, MINIP is an interested party in the sustainable use and conservation of mangroves.¹⁸⁷ CITMA may involve this ministry in discussions regarding controversial programs and proposals impacting mangroves. MINIP's 1996 regulations created a closed area that represents an untouched, rich area in terms of biodiversity, as well as an important nursery for juvenile fish.¹⁸⁸ This

179. See CUBAN ENVIRONMENTAL LAW, *supra* note 32, at 99.

180. Carlos Álvarez, CICA, CITMA, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 13, 2002); Evenson, *supra* note 29, at 520.

181. DECRETO-LEY NO. 201, art. 53; Ruiz, *supra* note 174.

182. CIGEA, *supra* note 19, at 24.

183. *Id.*

184. *Id.* at 26.

185. The author obtained this estimate by superimposing a map of the National System of Protected Areas on a map of vegetation cover. See CENAP, *supra* note 173, at 46-47; INSTITUTO CUBANO DE GEODESIA Y CARTOGRAFIA, ATLAS DE CUBA, *supra* note 21, at 38-41.

186. CENAP, *supra* note 173, at 46-47; INSTITUTO CUBANO DE GEODESIA Y CARTOGRAFIA, ATLAS DE CUBA, *supra* note 21, at 38-41; IUCN, *supra* note 16, at 356-57.

187. Interview with Carlos García, MINIP, in Havana, Cuba (Aug. 16, 2002).

188. Reglamento de Pesca, DECRETO-LEY NO. 164 [Fishing Regulations, DECREE LAW NO. 164], art. 21 (1996) (Cuba).

closed area included the waters off the mangrove-rich areas of the Zapata Peninsula, located on the south of Matanzas Province.¹⁸⁹ More recently, MINIP has declared another closed area adjacent to the Guanahacabibes National Park in Pinar del Río Province, another area with abundant mangrove forests.¹⁹⁰ MINIP has designated a total of thirteen marine zones under a “special regime of use and protection.”¹⁹¹

VI. PROGRESS AND PROBLEMS

A. *Economic Development*

Economic development, and the direct and indirect impacts that development activities may have on mangroves and other wetland areas, present challenges for mangrove managers. An estimated 30% of Cuban mangrove forests have experienced natural or anthropogenic impacts¹⁹² arising from industrial wastes from mining, sugar refineries and oil refineries, large cattle ranches, road construction, and illegal deforestation.¹⁹³ These direct and indirect impacts are common in most countries that possess mangroves. CITMA officials openly recognize the challenges that stem from economic development. However, they insist that this reality often leads to “win-win” situations of compromise.¹⁹⁴

1. Hydrological Changes

Alteration of hydrology in mangroves (draining and channelization), as well as at upstream sites, presents serious stressors on mangrove ecosystems due to mangrove ecosystems’ high dependency on an appropriate hydrologic balance.¹⁹⁵ One polemic example of the failure to protect mangroves in Cuba is Dique Sur (South Dike). Dique Sur is a large project that has caused significant damage to large areas of mangroves on the south coast of Havana Province. In the 1980s, authorities recognized that saltwater was intruding into the southern Havana Province aquifer, which supplies drinking water to the capital and irrigation water for large and important agricultural areas in the province. In an effort to stop saltwater intrusion northward, and loss of

189. *Id.*

190. Carlos García, MINIP, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 13, 2002).

191. Cruz, *supra* note 151; Garcia, *supra* note 190.

192. Milian Padrón et al., *supra* note 17, at 152; Menéndez et al., *supra* note 21, at 83.

193. Milian Padrón et al., *supra* note 17, at 152.

194. Orlando Reyes, CITMA, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 12, 2002).

195. See Lugo & Snedaker, *supra* note 6, at 56-57.

fresh water southward, authorities began construction of the Dique Sur in 1985. It is a 100 km long structure, 7 meters in width, and 2 to 4 meters deep, that stretches from Majana in the west to Batabanó in the east.¹⁹⁶ In the early 1990s, discussion centered on extending the dike eastward from Batabanó toward Zapata Swamp, but this never occurred. While the result of the Dique Sur project in controlling salt water intrusion has been inconclusive, harm to the mangroves and coastal ecosystems between the ocean and the dike has been evident.¹⁹⁷ Without the freshwater input, the increasing salinization has stressed mangrove vegetation, causing significant harm to the mangroves. A probable result of this harm has been an increase in coastal erosion on the province's south coast. This is especially serious because the southern coast of Havana and Pinar del Río Provinces are areas at high risk of coastal flooding.¹⁹⁸ In a major effort to resolve one problem (saltwater intrusion in an important aquifer), authorities displayed a lack of consideration for the full range of environmental impacts, and created other problems, mangrove loss and increased coastal erosion.

Alterations in freshwater hydrologic regimes are also affecting mangroves on the south coast of Pinar del Río Province in western Cuba.¹⁹⁹ Construction of dams has reduced freshwater flow to mangrove areas, resulting in increased salinization that can stunt mangrove growth.²⁰⁰

One hopes that the recent advances in Cuban environmental legislation, especially the EIA process, will prevent similar engineering errors in the future. Nevertheless, the off-site, or downstream, nature of the adverse impact on the mangrove ecosystem, as well as the scientific uncertainty of proving the adverse impact, may still impede full appreciation of a project's adverse impacts. The Coastal Zone Management Decree Law does not clearly address this issue. It states that the width of the protective buffer zone should be greater than 40 meters.²⁰¹ Many activities that could affect mangrove hydrology might

196. Interview with Leda Menéndez, *supra* note 106.

197. SERGIO DÍAZ-BRIQUETS & JORGE PÉREZ-LÓPEZ, CONQUERING NATURE: THE ENVIRONMENTAL LEGACY OF SOCIALISM IN CUBA 129-30 (2000).

198. Carlos M. Rodríguez et al., *El Ordenamiento Territorial en la Mitigación de las Inundaciones Costeras*, in PLANIFICACIÓN FÍSICA—CUBA 24, 27 (2001).

199. Mangrove researchers are aware that alterations in the hydrology of mangrove ecosystems and upland areas cause changes in the structure and function of mangrove forests. Lugo & Snedaker *supra* note 6, at 57; de Lacerda et al., *supra* note 7, at 39, 53.

200. Juan C. Pérez et al., *Análisis del Potencial Melífero del Mangle Prieto*, CUBA FORESTAL, 2000, at 25.

201. Gestión de la Zona Costera, DECRETO-LEY NO. 212 [Coastal Zone Management Decree Law, DECREE LAW NO. 212], arts. 4-5 (2000) (Cuba).

occur at much greater distances than this from the mangrove forest. Although we do not have information on the exact width of protective zones, and how they vary throughout the country, many activities that could adversely affect mangrove hydrology probably occur outside the protective zone.

2. Coastal Tourism Developments

Tourism development continues to destroy mangrove areas despite the new legislation. Tourism's economic impact is estimated to reach at least \$18.5 billion by 2007.²⁰² The number of annual international visitors to Cuba was approximately 1.8 million persons in 2000 and 2001.²⁰³ This number reflects a major effort by the Cuban government to increase international tourism and reap its economic benefits.²⁰⁴ This dynamic economic sector generates essential foreign exchange and creates opportunities for economic growth. For these reasons, the state has actively promoted joint ventures and foreign investment projects in the tourism sector since the beginning of the Special Period.²⁰⁵

The Ministry of Tourism has developed sectoral policies to promote tourism. The IPF's responsibilities include development of zoning plans to site new tourism facilities.²⁰⁶ New tourism facilities, especially those located in coastal ecosystems, require an environmental license to operate in all cases, and may also have to produce an EIS.²⁰⁷ CITMA, of course, oversees tourism developments through the environmental license and EIA process.²⁰⁸ Sustainable tourism development is the official goal for the responsible state institutions.²⁰⁹ The 1995 Foreign Investment Law incorporates this goal in projects generated by foreign capital investments.²¹⁰

However, because coastal tourism is the principal focus of Cuban tourism growth, siting of new facilities often has the potential to produce

202. Houck, *supra* note 1, at 42.

203. Medina, *supra* note 140.

204. *See id.*

205. *See* Kenyon Lindeman et al., *Sustainable Coastal Tourism in Cuba: Roles of Environmental Impact Assessments, Certification Programs, and Protection Fees*, 16 TUL. ENVTL. L.J. 591, 597 (2003).

206. Anselmo Pagés Torriente, *Importancia del Ordenamiento Territorial en el Turismo*, in PLANIFICACIÓN FÍSICA—CUBA 3-4 (2001).

207. GUILBEAUX ET AL., *supra* note 37, at 230.

208. *See* Lindeman et al., *supra* note 205, at 594.

209. Ley del Medio Ambiente, LEY NO. 81, art. 141; Medina, *supra* note 140.

210. Ley de la Inversión Extranjera, LEY NO. 77 [Foreign Investment Law, LAW NO. 77], art. 54 (1995) (Cuba) ("Foreign investment . . . will carefully respect environmental conservation and the rational use of natural resources.").

direct and indirect impacts on coastal ecosystems, such as mangroves. The weakest link, and greatest challenge, in this process is the fragile coastal area, particularly low-lying, mangrove-covered keys.

One recent example is illustrative. The Sabana-Camagüey Archipelago lies on the north central coast of Cuba. IPF zoning of Cayo Coco has considered the fragility of the key's ecosystems. Principal zoning classifications include tourism development, protected forests, and forests for recreation.²¹¹ However, these are flat keys, less than 5 meters in elevation with beaches, sand dunes, and mangroves, that are extremely sensitive by nature. IPF suggests that the maximum potential number of rooms for Cayo Coco is 16,100.²¹² This is approximately 50% of the current number of hotel rooms in Cuba.²¹³

The development of tourism complexes on the keys of the Sabana-Camagüey sub-archipelago has been extremely controversial. Several causeways over 15 km in length connect the mainland to the keys and largely block water circulation within the coastal lagoon.²¹⁴ Alteration of water circulation caused by an additional causeway between Cayo Coco and Cayo Romano has allegedly resulted in some mangrove die-offs.²¹⁵ Development of hotel and tourism infrastructure on some of the keys inevitably occurs on, or near, coastal dunes and in mangrove areas. The 370 km² Cayo Coco has no permanent residents.²¹⁶ Nevertheless, today over 7000 people (tourists and residents) reside on the key.²¹⁷ This is just one example of how environmental laws and regulations often fail when the economic interest in the project is great.

Interagency debate will continue over "coastal dependent activities" and "fragile keys."²¹⁸ Which activities are "coastal dependent" and which keys are "fragile" have an objective, scientific basis. However, they are also determinations that are largely political and open to significant subjective interpretation, and, therefore, the interests of tourism development. The economic power and foreign exchange revenues that

211. Jorge Castro, *El Desarrollo Turístico de Cayo Coco y su Importancia en la Región de Influencia*, in PLANIFICACIÓN FÍSICA—CUBA 24-26 (2001).

212. *Id.* at 26.

213. Medina, *supra* note 140.

214. DÍAZ-BRIQUETS & PÉREZ-LÓPEZ, *supra* note 197, at 264; Castro, *supra* note 211, at 24.

215. Armando H. Portela & Benigno E. Aguirre, *Environmental Degradation and Vulnerability in Cuba* 1, 21 (2000), at <http://www.udel.edu/DRC/Aguirre/publications/ag70.pdf>.

216. Celso Pazos, Centro de Investigación de Ecosistemas, CIEC, Address to the CITMA-Tulane Cuban Environmental Law Symposium (Aug. 13, 2002).

217. *Id.*

218. Gestión de la Zona Costera, DECRETO-LEY NO. 212 [Coastal Zone Management Decree Law, DECREE LAW NO. 212], arts. 15.1, 25 (2000) (Cuba).

the tourism industry earns are powerful forces that work against environmental conservation and present significant challenges to the efforts of the personnel of CITMA and the State Forestry Service.

B. Challenges from Local Residents

Poor coastal residents have traditionally used mangrove wood to produce charcoal by means of “charcoal ovens.” I met several charcoal makers attending their “ovens” on the south coast of Havana Province (Playa Rosario) in August 2002. Several moments later, after they became aware of the presence of environmental authorities, they disappeared. Today, use of unapproved “charcoal ovens” is illegal, but, nevertheless, remains very common. This highlights the contradiction between official policy and actions by coastal residents, the unsatisfied needs of many coastal residents, and the need for better environmental education.

Another example provides a different twist on activities of local residents that damage mangroves. In August 2002, at the village of Playa Mayabeque on the south coast of Havana Province, some members of a fishing cooperative had recently cut a canal through mangroves to construct a marina for their fishing vessels.²¹⁹ The activity cleared an area of mangroves approximately 100 x 10 meters in area.²²⁰ The government official who accompanied me indicated that she would report the damage to the President of the Municipal Government. However, she emphasized that identifying the responsible party and satisfying the burden of proof made application of penalties unlikely.²²¹

An additional example is in Playa Rosario, and other towns on the southern coast of Havana Province, where rapid erosion (approximately 3 meters per year) is destroying the local mangrove forests and the village itself.²²² Residents are now harvesting mangrove wood from nearby offshore keys to produce charcoal, while previously they harvested wood from mangroves adjacent to the village on the mainland.

C. Institutional Arrangements

Although CITMA is a new ministry that does not produce goods capable of generating foreign exchange and often is viewed as presenting

219. At the time of our visit, we did not have proof of the responsible parties. Interview with Fara Carreras, Dirección Provincial de Planificación Física La Habana, in Playa Mayabeque, Cuba (Aug. 14, 2002).

220. The authorities had denied their previous request to dig the canal. *Id.*

221. *Id.*

222. Interview with Leda Menéndez, *supra* note 106.

obstacles to development projects, it carries out its role of environmental coordinator with increasing assertiveness and leadership. The legal authorities grant CITMA express responsibility to ensure that other ministries and private investment initiatives integrate environmental considerations into their activities.²²³ The systems of environmental licenses and the EIA process are CITMA's principal means of carrying out its mission.

Although CITMA's leadership role in the environmental arena is clear and undisputed, problems exist. CITMA has limited resources to apply the laws it is charged with implementing. It directly employs few personnel who can actually evaluate forestry management plans and the uncertainties surrounding the environmental impacts to mangroves from off-site activities, such as alterations of the hydrologic regime. When a project funded by foreign investment arrives for CITMA's consideration, IPF has already granted the project microlocalization.²²⁴ This prior approval by a strong state planning authority may alter the balance in CITMA's assessment. IPF approval may fix a project's location before the EIA process occurs.

Also, institutional coordination does not always work as efficiently as it could. Tensions exist between CITMA and its affiliated Institute for Ecology and Systematics and MINAGRI (State Forestry Service) over operations to harvest mangroves. These two institutions tend to possess different environmental values, CITMA being more conservation oriented and "green," while MINAGRI and its State Forestry Enterprises tend to embrace a multiple use philosophy where "production" clearly has a primary role.²²⁵ An official of the State Forestry Service commented that "if it only depended on CITMA, we wouldn't be able to cut a single tree."²²⁶

Tensions also exist between CITMA's Institute for Ecology and Systematics and other agencies that wish to develop in mangrove areas or whose activities may affect the hydrology of mangrove areas. Some mangrove experts at the Institute are, by nature or professional training, more "conservation oriented" than others, and are sometimes considered recalcitrant. CITMA has not always invited the experts with greatest experience in mangroves to its EIA coordination and evaluation meetings

223. See Houck, *supra* note 1, at 19-20.

224. See *id.* at 29-30.

225. See Marc L. Miller & Jerome Kirk, *Marine Environmental Ethics*, 17 OCEAN & COASTAL MGMT. 237, 243-46 (1992).

226. Interview with a State Forestry Service official, MINAGRI, in Havana, Cuba (Aug. 13, 2002).

because these experts might raise difficult issues that could block or delay approval of priority projects. Some experts are commonly known to be “excessively concerned” about the potential adverse environmental impacts that a project might have on mangrove ecosystems. The common saying in Cuban government circles is “You cannot eat mangroves” (“*No se puede comer el manglar*.”). In essence, while conservation is a laudable ideal, it does not generate foreign exchange.

D. Legislation

The consistency between the Environmental and Forestry Laws and Regulations and the Protected Area and Coastal Zone Decree Laws is remarkable. Drafted during the same period, much effort was invested in linking the various legislative instruments. They are clear with respect to the objectives and guiding principles, responsible authorities and their duties, and interagency coordination. Law No. 81, as a framework law, facilitates this arrangement. Its section on Forestry Patrimony (chapter V, section 3, arts. 112-115) mirrors concepts in the Forestry Law, such as categories of forests. Many other examples of this parallel structure are evident throughout this legislation.

Institutional coordination is the key to Cuba’s system of environmental and coastal management. All the legislative authorities stress the shared responsibility of CITMA, IPF, MINAGRI, and other state institutions to consult with one another. However, mandating the more precise and detailed mechanisms for this institutional coordination would be advantageous. This might include, for example, the formation of an interinstitutional coordinating commission on mangroves, with specification of the composition and decision-making procedures. The necessity is to define the extent to which “consult” means “take into consideration the opinions of the interested parties.” Further development of dispute resolution mechanisms is another area for potential improvement in the legislation.

The relationship between CITMA and IPF is somewhat unclear. Law No. 81 grants CITMA the authority to act as the supreme environmental authority in Cuba, responsible for coordination and integration of the environmental standards and objectives into the actions of all other state institutions. However, at the same time, the IPF develops land-use and zoning plans, and may initially conclude that a new development project is consistent with zoning plans (microlocalization) before CITMA has considered the approval of an environmental

license or the EIS.²²⁷ This situation could tip the balance in favor of the siting of the activity that the IPF has already approved.

Other legislative issues are problematic or, at least, unclear. One such instance involves protective shoreline forests outside of protected areas and the degree of protection that should be granted to them. According to the Coastal Zone Management Decree Law, the coastal zone includes all mangroves. A presumption exists against siting facilities in the coastal zone. However, coastal dependent uses may be allowed in the coastal zone. Arguably, tourist beach hotels may be classified as coastal-dependent uses. Similarly, the Coastal Zone Management Decree Law prohibits authorization of any type of construction on fragile keys, keys completely covered with mangrove vegetation, or keys completely located within the coastal zone.²²⁸ CITMA has the responsibility of identifying “fragile keys.”²²⁹ The Forestry Law defines shoreline forests to be not less than 30 meters from the “maximum point of tidal influence,” an uncertain term at best. No timber exploitation, construction of installations, or permanent removal of vegetation may occur in shoreline protective mangroves, according to the Forestry Law. A contradiction may exist between these two legal authorities. CITMA might grant approval for a “coastal dependent use” that could possibly be located in a shoreline mangrove forest in which MINAGRI prohibits construction of installations. However, the Forestry Law and its regulations are not absolute, and do provide for utilization of forests for nonforestry activities and, in some circumstances, conversion to other uses. This latter case may become a decision at the highest ministerial level. In short, provisions exist in both the Coastal Zone Management Decree Law and the Forestry Law to permit conversion of shoreline protective mangroves to tourism installations, marinas, or other “coastal dependent uses.” However, these decisions appear to require a high degree of coordination at the highest levels of both CITMA and MINAGRI.

Other conflicts surround “fragile keys” and “coastal dependent activities.” These designations are not solely scientific; there are significant political and economic interests at work as well. Clearly, the economic importance of the coastal development activity will play a role

227. Reglamento del Proceso de Evaluación de Impacto Ambiental, RESOLUCIÓN NO. 77/99 [Environmental Impact Assessment Regulations, RESOLUTION NO. 77/99], art. 15 (1999) (Cuba); see Houck, *supra* note 1, at 29; Rodríguez, *supra* note 138.

228. Gestión de la Zona Costera, DECRETO-LEY NO. 212 [Coastal Zone Management, DECREE LAW NO. 212], art. 26.1 (2000) (Cuba).

229. *Id.*

in determining whether or not a key is fragile. Decree Law No. 212 should provide additional guidance for the application of these terms. The legislation should set forth factors that authorities should consider when determining whether or not an activity is “coastal dependent.”

E. EIA for Agency Management Plans

Preparation of a “strategic” EIA for management plans should be a requirement for good environmental management, but, currently, such an evaluation does not occur.²³⁰ Law No. 81 states that CITMA, in coordination with other competent institutions, *may* require an EIA for the institutions’ sectoral development plans, such as urban and industrial development, forestry management, hydrologic management, tourism development, mining and fishery plans, and land-use plans.²³¹ An EIA, however, is not obligatory.²³² Given the importance of the state sectors in the centralized Cuban economy, this could be a significant loophole in the environmental review of the planning process.

F. State Structure and Its Inherent Organic Contradictions

A fundamental contradiction exists in Cuba’s regulatory structure. The State is the producer, as well as the regulator and enforcer. Economic interests are clearly the priority. How can the state enforce its own actions? How can the government fine itself? Some commentators have suggested that state enterprises are “unresponsive to environmental policy.”²³³ Of particular interest for mangroves are the State Forestry Enterprises, the State Fishing Cooperatives, and State Plans for Tourism or Aquaculture Development. The economic importance of these activities, and the institutional history prior to the existence of CITMA, both present major challenges to the effective integration of environmental concerns into the productive activities of these state institutions.

For example, the regulations of the Forestry Law provide for recovery of damages by the State Forestry Enterprises and forestry authorities from damages caused by other parties.²³⁴ However, the

230. GUILBEAUX ET AL., *supra* note 37, at 129; Cruz, *supra* note 151.

231. Ley del Medio Ambiente, LEY NO. 81 [Environmental Law, LAW NO. 81], art. 31 (1997) (Cuba), *translated in* CUBAN ENVIRONMENTAL LAW, *supra* note 32, at 21.

232. GUILBEAUX ET AL., *supra* note 37, at 129.

233. Houck, *supra* note 1, at 65.

234. Reglamento de la Ley Forestal, RESOLUCIÓN NO. 330/99 [Forestry Law Regulations, RESOLUTION NO. 330/99], art. 159 (1999) (Cuba).

regulations are silent with regard to damages caused by the State Forestry Enterprises themselves.

G. Reforestation

The reforestation programs of the State Forestry Service/MINAGRI are excellent, low-cost models for other Caribbean and Latin American countries, as well as for Florida. Reforestation is a requirement in productive mangrove forests after harvesting.²³⁵ Nonforestry activities in areas of forest patrimony also require the responsible party to restore damaged areas or to pay the costs of restoration. This is the case for scenarios of permanent conversion of forests and damage without permanent conversion.²³⁶

H. The Ramsar Convention

Cuba recently acceded to the Ramsar Convention (Convention on Wetlands of International Importance Especially as Waterfowl Habitat) and the international agreement entered into force for Cuba in August 2001.²³⁷ With its accession, Cuba nominated a 452,000 ha. site in the Zapata Swamp on the south central coast to the List of Wetlands of International Importance.²³⁸ The Zapata Swamp includes the largest mangrove area in Cuba, as well as many types of freshwater wetlands.²³⁹ The core area is the site of a national park and other categories of protected areas (Wildlife Refuges and Floristic Reserves).²⁴⁰ The area that Cuba listed also encompasses the Bay of Pigs (*Bahía de Cochinos*). The site has been a UNESCO Biosphere Reserve since January 2000, and is the largest and best-preserved wetland in the Caribbean.²⁴¹ Listing the Zapata Swamp will increase its protected status within Cuba, and should focus international conservation attention on the area.

235. Ley Forestal, LEY NO. 85 [Forestry Law, LAW No. 85], art. 35(b), (d) (1998) (Cuba).

236. RESOLUCIÓN No. 330/99, arts. 2, 129-130, 150.

237. RAMSAR CONVENTION BUREAU, THE ANNOTATED RAMSAR LIST: CUBA (2002), at <http://www.ramstar.org/profiles/Cuba.htm> [hereinafter RAMSAR CONVENTION BUREAU].

238. *See id.*

239. *See generally* ALFREDO NIETO DOPICO, LA FAUNA SILVESTRE DE LA CIÉNAGA DE ZAPATA (1997) (describing the rich fauna of Ciénaga de Zapata).

240. RAMSAR CONVENTION BUREAU, RAMSAR SITES DATABASE—CUBA 6CU001 (2002), at http://www.wetlands.org/RDB/Ramsar_Dir/Cuba/CU001D02.htm.

241. RAMSAR CONVENTION BUREAU, *supra* note 237.

VII. CONCLUSIONS

Cuba faces, as do most tropical coastal nations, a tension between the conservation of its coastal mangroves forests and the need to promote economic development that can supply foreign exchange and create employment opportunities. Mangroves provide important ecological functions, but the coastal space they occupy may also be prime real estate for tourism development, marinas, or port facilities. The rapid growth of coastal tourism in recent years, as well as future plans to accelerate this economic engine, suggest that the tension between mangrove conservation and development in their space will become even more intense. Additionally, off-site activities that alter the mangrove's hydrological regime will continue to challenge the efforts of the regulators of these coastal wetlands.

The recent development of a comprehensive, consistent body of environmental legislation applicable to mangroves is an extremely significant step toward effective management of these coastal forests. The legal authorities stress institutional coordination and consultation in the decision-making and planning processes regarding productive activities that could potentially damage this forestry resource. While recognizing the important ecological functions and contributions of the mangrove ecosystem, the laws leave open the possibility for a controlled and limited use of the resources, as well as of the coastal space they occupy. Despite the immediate economic benefits of coastal development projects, the institutional redundancy between IPF, CITMA, and MINAGRI appears to be producing restraint on nonsustainable coastal developments in Cuba.

It remains to be seen whether the new legislation will be effectively implemented and whether these legal authorities will provide the necessary guidance to effectively control coastal development. However, evidence continues to show that the institutional structure is responding positively to the new legal regime. Perhaps it will be possible to continue to eat some of the faunal species that inhabit the mangrove ecosystem, as well as to benefit from limited and controlled coastal development that provides food for the Cuban people.